

**ABSTRACT OF THE DISCLOSURE**

Briefly described, new types of nanostructures and methods of fabrication thereof are disclosed. A representative nanostructure includes a free-standing, helical semiconductor oxide nanostructure. The free-standing, helical semiconductor oxide nanostructure includes a nanobelt having a substantially rectangular cross-section. The nanobelt is about 5 nanometers to about 200 nanometers in width and about 3 nanometers to about 50 nanometers in height, and the radius of the helical semiconductor oxide nanostructure is about 200 to 5000 nanometers.